



## TECHNICAL DESIGN CONCEPTS TO IMPROVE HELICOPTER OBSTACLE AVOIDANCE AND OPERATIONS IN "BROWNOUT" CONDITIONS

[0001] This invention claims priority to U.S. Provisional Patent Application 60/458,257 dated March 31, 2004.

### Background of the Invention

#### Field of the Invention

[0002] This invention relates generally to flight control systems and display systems for vertical take off and landing capable aircraft.

#### Description of the Prior Art

[0003] Hazardous weather conditions significantly limit the operational capability of helicopters. Helicopters are called upon routinely to approach and land at remote sites without the aid of navigation guidance or acceptable and safe visual conditions. Often the topography, ground hazards, obstacles and weather in the area are unknown or changing. Upon arrival at a remote location, the pilot must make critical judgments based on incomplete or inaccurate data available to him in order to determine the proper procedure to approach and land at the site. If the surface condition is such that dust, snow, sand, etc. will be blown up by rotor downwash, the helicopter is often suddenly engulfed in a cloud of visually-restrictive material, causing the pilot to lose his visual references. The loss of visual references causes spatial disorientation problems that impede a pilot from making a fully stabilized safe landing.

[0004] The pilot uses his visual references for determining his control strategy to stabilize and bring the aircraft to a prelanding quiescent trim condition and to establish his ground closure rates as he finalizes his approach and touches down. In interviews with pilots, it was determined that pilot workload and procedures such as cross cockpit checks increase during a tactical "brownout" landing. When references are lost, a pilot may know his attitude references, but he is most likely unaware of his fore and aft, lateral, and vertical speed relative to the ground. He may also not be aware of the local terrain contour for a safe all wheel settling to the ground.